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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
Division of Forest Insect Investigations

MOUNTAIN PINE BEETLE

CONNESS BASIN, YOSEMITE NATIONAL PARK

AUGUST 1953

APPRAISAL SURVEY

In the latter part of June, 1953, during the course of population sampling for the lodgepole needleminer, Recurvaria milleri Busck, in the Conness Basin Area of Yosemite National Park, G. L. Downing and C. J. Wray of the Forest Insect Laboratory reported a large number of lodgepole pine along upper Conness Creek currently infested with mountain pine beetle, Dendroctonus monticolae Hopk. In previous epidemics, the lodgepole needleminer - mountain pine beetle association has been the primary cause of lodgepole pine mortality over an extensive area in the upper Tuolumne watershed of Yosemite National Park. Hence, this was an important discovery, for it was the first report of such activity in the areas of lodgepole pine defoliated during the current needleminer outbreak.

In early August a reconnaissance survey of the reported mountain pine beetle infestation was made by R. C. Hall and B. E. Wickman. New attacks by the beetle were found to be very numerous; therefore, plans were made for an appraisal survey to accurately evaluate the extent and seriousness of the infestation. This survey was completed by B. E. Wickman and A. G. Samuelson during the latter part of August.

Insect and Host Species

The insect immediately responsible for most of the tree mortality occurring in the Conness Basin Area is the mountain pine beetle. The damage is confined to lodgepole pine, the only host involved, which occurs over an extensive area in pure stands. Past experience has shown that mountain pine beetle infestations in lodgepole pine are a natural aftermath of severe defoliation by the lodgepole needleminer. The needleminer, as its name implies, injures trees by mining out the needles, destroying the foliage, sometimes seriously enough to kill the tree. Partly defoliated trees are seriously weakened and provide excellent sites for the development of mountain pine beetle epidemics.

Status and Scope of Infestation

The area presently under attack by the mountain pine beetle coincides with the location of the heaviest defoliation by the needleminer, as would be expected. It totals 500 acres in a strip about 1/2 mile wide and 2 miles

long along upper Conness Creek (see map). The stand in this area consists of mature lodgepole pine, ranging in size from 10 to 50 inches DBH, with an understory of young growth.

The infestation area was sampled by means of a series of 1/2-acre circular plots 5 chains apart. A complete stand inventory was taken on each of these plots. A total of 92 plots, or 46 acres was sampled throughout the 500 acres, resulting in almost a 10% cruise. On each plot a complete stand inventory of all trees above 10 inches DBH was taken. A tally was made of trees currently infested or recently killed by mountain pine beetle, defoliated by lodgepole needleminer, or killed by other causes. The following table shows the estimated amount of damage caused by the mountain pine beetle.

Green Stand and Estimated Loss from Mountain Pine Beetle in Conness Infestation Center

	No. Trees Per Acre	Average Diameter	Percent of Stand Killed
Green Stand	46.6	19"	
Infested 1952	2.8 ± 0.40	21"	5.2
Infested 1953	4.1 ± 0.55	23"	8.1

The estimated number of currently infested trees on 500 acres is 2050 ± 275 ranging in diameter from 10 to 42 inches DBH. The total stand is estimated to be 53.5 trees per acre, of which 6.9 trees per acre, or 12.9 percent, has been killed by the mountain pine beetle in the last two years.

Discussion

The appraisal survey shows that the mountain pine beetle outbreak in Conness Basin is at present confined to a relatively small area, but that it has potentialities for developing into an epidemic of a magnitude comparable to that which previously occurred in upper Tuolumne watershed 40 years ago. The trend toward outbreak conditions is indicated by the fact that in the recent past, prior to 1952, very few trees were attacked by this beetle. During 1952 the average number infested was 2.8 trees per acre. In 1953 the number increased by 50 percent to 4.1 infested trees per acre. This makes a total of 6.9 trees per acre or 12.9 percent of the lodgepole pine stand killed by the mountain pine beetle in the last two years. This build-up, although confined to 500 acres at the present time, could become explosive both in extent and intensity. Adjacent to Conness Basin are extensive areas of mature and overmature lodgepole pine that have sustained severe defoliation. Unless the mountain pine beetle can be prevented from spreading into these areas, there are good prospects that another legion of ghost forests will spring up to replace those that are now disappearing.

Recommendations

1. Control Program - In view of the threat of more widespread damage posed by the mountain pine beetle concentration in lodgepole pine along upper Conness Creek, direct control of the existing infestation prior to July 1, 1954 is recommended.

a. Method - The infested trees should be felled and bucked, and the infested portions of the trunks treated with toxic sprays. The spray should be applied with a compressed air sprayer, and the trees rolled as needed to secure proper coverage.

b. Insecticide materials - Subject to confirmation by field tests to be made by the Forest Insect Laboratory, it is recommended that ethylene dibromide emulsion be used. This insecticide is a water emulsion made up of 1 gallon of ethylene dibromide emulsion concentrate to 4 gallons of water. Since water is readily available in the Conness Basin, it will be necessary to transport only the concentrate into the area. The formula for the concentrate is as follows:

Ethylene dibromide	-	2 pounds
Triton X-100	-	3 ounces
Triton B-1956	-	5 ounces
Diesel oil to make	-	1 gallon

This formulation is not available commercially, and it will be necessary to either procure and mix the materials, or have the emulsion prepared to specifications by a commercial firm.

c. Costs - It is estimated that 16,400 gallons of finished spray, containing 3,280 gallons of ethylene dibromide emulsion concentrate, will be needed to treat the 2,050 trees that are infested. This estimate is based on an average tree of 23 inches DBH, with an infested length of 40 feet to a 12-inch top (304 square feet of bark surface). One gallon of the finished spray will treat about 40 square feet of bark on lodgepole pine, so that for the average tree approximately 8 gallons of spray will be needed. The quantity and approximate cost of the chemicals for the 3,280 gallons of emulsion concentrate required are as follows:

Ethylene dibromide 1/	6,560 lbs. at $0.33 lb.	$2,165.00
Triton X-100 2/	615 lbs. at $0.36 lb.	222.00
Triton B-1956 2/	1,025 lbs. (128 gals) at $5.60 gal.	720.00
Diesel oil	2,814 gals. at $0.13 gal.	366.00
	TOTAL	$3,473.00

1/ Available from Dow Chemical Co., 350 Sansome St., San Francisco

2/ Available from ~~Robin~~ Rohm and Haas Co., 25 Beale St., San Francisco

Other costs, especially those for labor for mixing the spray, felling, bucking, and treating the trees, and packing the materials in to the Conness area will probably boost the cost of the project considerably. In the light of past experience, it is suggested that a figure of $10 per tree be used in estimating over-all costs. This would place the total cost of the project at $20,500.

2. Detection of Additional Outbreaks - Close watch should be kept on all of the lodgepole pine type within the boundaries of the current needleminer infestation in order to promptly detect any other centers of mountain pine beetle damage that may be developing. Should such centers be found, prompt control action will be required.

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Forest Insect Laboratory
Berkeley, California
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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
BERKELEY FOREST INSECT LABORATORY

MOUNTAIN PINE BEETLE INFESTATION
CONNESS BASIN

YOSEMITE NAT'L PARK

1953

LEGEND

Infested with Mountain Pine Beetle

Trail

SCALE

In 0 ¼ ½ ¾ 1 2 Miles